Indicator: Chesapeake Bay Blue Crabs: Mature Females - Spawning Stock Abundance (320R)

The blue crab represents a valuable commercial fishery across much of the eastern coast of the U.S. fishery. In Chesapeake Bay, harvest pressure on the species and the loss of the submerged aquatic vegetation habitat that young crabs require for shelter and food during their development, have led directly to the decline in the blue crab's numbers (*1997 Chesapeake Bay Blue Crab Fishery Management Plan;Blue Crab 2003, Status of the Chesapeake Population and its Fisheries; Blue Crab; Blue Crabs in the Chesapeake, About Blue Crabs).* Spawning stock abundance of female blue crabs is a key determinant of the status of this important fishery.

This indicator reflects trends in the spawning stock abundance of female blue crabs based on four fishery-independent surveys used to determine stock status: the Virginia trawl survey, the Maryland summer trawl survey, the Calvert Cliffs crab pot survey, and the Bay wide winter dredge survey. Data from the two trawl surveys and the Calvert Cliffs pot survey are based on calendar year collections through 2003. The winter dredge survey data represent seasonal collections from December 2003 through March 2004. Indices from the winter dredge survey are expressed as estimates of the number of crabs per unit area; all other indices are expressed as the geometric mean catch per unit effort. Modified and standardized width-age cutoff values are used to differentiate age classes for three of the four surveys (Maryland and Virginia trawl and Calvert Cliffs pot survey) used to derive the abundance indices (*2004 Chesapeake Bay Blue Crab Advisory Report).*

What the Data Show

Based on a standardized, transformed index of mature females, spawning stock biomass trended upwards 2001 through 2003 after hitting a historic low in 2000, but has been below the long-term average in all years since 1992, with the exceptions of 1996 and 1997 (Figure 320R-1). (*2004 Chesapeake Bay Blue Crab Advisory Report).*

Indicator Limitations

- A comprehensive update of the blue crab stock assessment is underway and the new assessment will use updated data treatments and methodologies that will likely alter the trend patterns presented in this indicator

Data Sources

Chesapeake Bay, Trends and Indicators, http://www.chesapeakebay.net/pubs/statustrends/75-data-2002.xls Derek Orner, NOAA Chesapeake Bay Office (derek.orner@noaa.gov)

References:

1997 Chesapeake Bay Blue Crab Fishery Management Plan. Chesapeake Bay Program. June 1997. EPA 903-r-97-015 CBP/TRS 175/97

Blue Crab 2003, Status of the Chesapeake Population and its Fisheries. Chesapeake Bay Commission Blue Crab Technical Workgroup. November 2003. (http://www.chesbay.state.va.us/CBC%20018%20crab%20report.pdf)

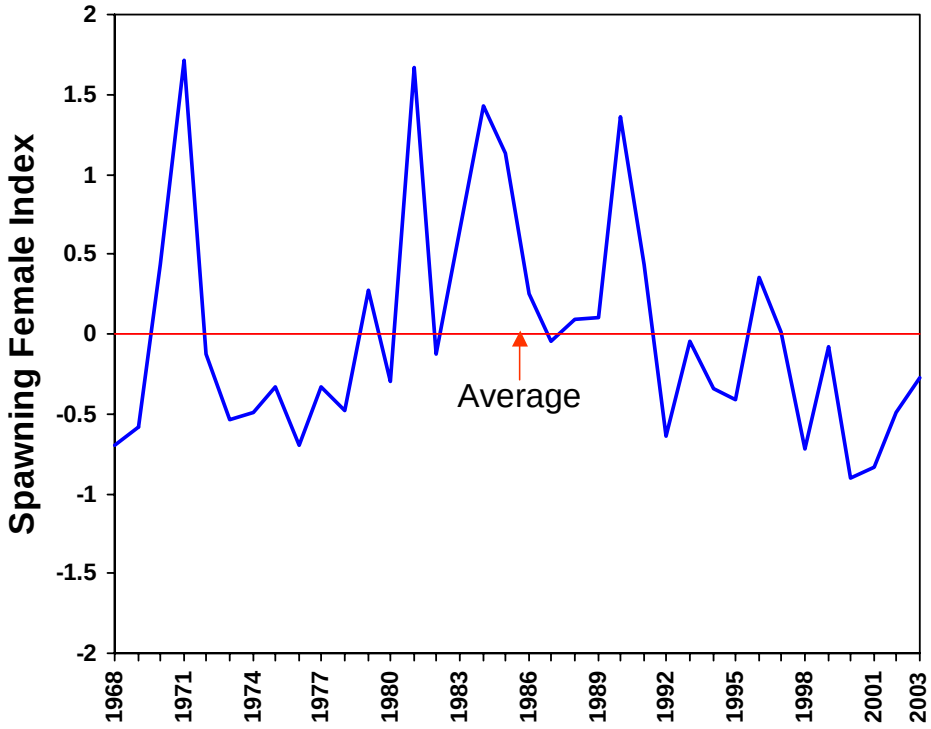
Blue Crab. Chesapeake Bay Program website. December 10, 2004. (http://www.chesapeakebay.net/blue_crab.htm)

Blue Crabs in the Chesapeake, About Blue Crabs. Maryland Sea Grant, University System of Maryland, November 19, 2002. (http://www.mdsg.umd.edu/crabs/about.html)

2004 Chesapeake Bay Blue Crab Advisory Report. Chesapeake Bay Stock Assessment Committee. June 2, 2004. (http://noaa.chesapeakebay.net/fish/BCAR2004.pdf)

Graphics

Figure 320R-1: Chesapeake Bay Blue Crabs: Mature Females Spawning Stock Abundance



R.O.E. Indicator QA/QC

Data Set Name: CHESAPEAKE BAY BLUE CRABS: MATURE FEMALES - SPAWNING STOCK ABUNDANCE
Indicator Number: 320R (89154)
Data Set Source: NOAA Chesapeake Bay Office
Data Collection Date: 1986-2003
Data Collection Frequency: 1 yr
Data Set Description: Chesapeake Bay Blue Crabs: Mature Females
Primary ROE Question: What are the trends in extent and condition of coastal waters

Question/Response

T1Q1 Are the physical, chemical, or biological measurements upon which this indicator is based widely accepted as scientifically and technically valid?

Yes. Very good quality and Bay coverage is provided in the data set. Mature female data set is a combination of several different fishery-independent surveys. The MD Trawl Survey which samples the major tributaries in MD; VA Trawl survey providing information for the mainstem and tributaries in VA; Calvert Cliffs pot survey which is a small spatial scale survey in the mid-portion of Chesapeake Bay; and the Baywide winter dredge survey which samples over 1500 stations Baywide. For additional information refer to the 2004 Chesapeake Bay Blue Crab Advisory Report Prepared by the Chesapeake Bay Stock Assessment Committee: June 2, 2004, at http://noaa.chesapeakebay.net/fish/BCAR2004.pdf. Report results and recommendations are developed by a Committee consisting of scientists from MD and VA academic and management agencies as well as the National Marine Fisheries Service. The methods have been introduced at various times in various peer reviewed journal entries. Contact Derek Orner, NOAA Chesapeake Bay Office (derek.orner@noaa.gov).

T1Q2 Is the sampling design and/or monitoring plan used to collect the data over time and space based on sound scientific principles?

Yes. Individual sampling designs/monitoring plans are in effect for each state. The winter dredge survey was designed with a Baywide comprehensive sampling frame in mind. Maryland DNR runs the MD trawl program. Virginia Institute of Marine Science (VIMS) oversees the VA trawl survey. The Academy of Natural Sciences runs the Calvert Cliffs survey and the NOAA Chesapeake Bay office coordinates the winter dredge survey between Maryland DNR and VIMS. **MD trawl survey began in 1977 (Maryland Summer Trawl Survey runs May-November; Chester, Choptank, Patuxent, Tangier, Pocomoke; 1/4" mesh, 16' net; 6 minute tow; measures crabs per tow) **Calvert Cliffs survey began in 1968 (Calvert Cliffs Pot Survey runs April-November; 3 locations, 60 pots total; 1" pot mesh; measures crabs per pot.) **Virginia trawl survey began in 1955 (Virginia Trawl Survey runs January-December; most Virginia inland waters;130 stations per month; 1/4" mesh, 30' net; 5 minute tow; measures crabs per tow) **Winter dredge survey began in 1990 (Winter dredge Survey runs December-March; Baywide; ~ 1500 stations; 1/2" mesh, 6' dredge; 100m tow; measures crabs/1000sq. meters) The surveys have all been collecting data for the benefit of making resource management decisions. None of the surveys are currently mandated however, all provide critical information in maintaining the status of the blue crab resource. For additional information refer to the 2004 Chesapeake Bay Blue Crab Advisory Report Prepared by the Chesapeake Bay Stock Assessment Committee: June 2, 2004, at http://noaa.chesapeakebay.net/fish/BCAR2004.pdf. Contact Derek Orner, NOAA Chesapeake Bay Office (derek.orner@noaa.gov).

T1Q3 Is the conceptual model used to transform these measurements into an indicator widely accepted as a scientifically sound representation of the phenomenon it indicates?

Yes. This indicator has undergone extensive technical and peer review by state, Federal and non-government organization partner members of the Chesapeake Bay Stock Assessment Committee (CBSAC) and the Living Resources subcommittee. Data collection, data analysis and QA/QC is conducted by the principal investigators/scientists. The data are peer reviewed by scientists on the CBSAC. Data selection and interpretation, the presentation of the indicator, along with all information and messages that accompany it is arrived at via consensus by the scientists in collaboration with the resource manager members of the CBSAC. The CBSAC presents the indicator to the subcommittee where extensive peer review by Bay Program managers occurs. The indicator is published at http://www.chesapeakebay.net/status.cfm?sid=75. The data used to construct the chart are located at http://www.chesapeakebay.net/pubs/statustrends/75-data-2002.xls. For additional information refer to the 2004 Chesapeake Bay Blue Crab Advisory Report Prepared by the Chesapeake Bay Stock Assessment Committee: June 2, 2004, at http://noaa.chesapeakebay.net/fish/BCAR2004.pdf. Contact Derek Orner, NOAA Chesapeake Bay Office (derek.orner@noaa.gov).

T2Q1 To what extent is the indicator sampling design and monitoring plan appropriate for answering the relevant question in the ROE?

These surveys are used to determine trends in extent and conditions of blue crabs in coastal waters in the Chesapeake Bay region. MD Trawl survey data were initially collected for various fish species but not until 1977 was blue crab catch information added to the survey. The VA trawl survey has been collecting information since 1955 and again is not a blue crab targeted survey but does collect information required for analyses. Calvert Cliffs pot survey was initially began in 1968 to provide information for the construction of Calvert Cliffs nuclear power plant. The lead scientist for the project has continued to collect information over the timeframe in a consistent manner. The winter dredge survey was designed in 1990 and was designed specifically to garner information on a Baywide scale on the population of blue crab in Chesapeake Bay. By far, this is the most comprehensive blue crab survey. For additional information refer to the 2004 Chesapeake Bay Blue Crab Advisory Report Prepared by the Chesapeake Bay Stock Assessment Committee: June 2, 2004, at http://noaa.chesapeakebay.net/fish/BCAR2004.pdf. Contact Derek Orner, NOAA Chesapeake Bay Office (derek.orner@noaa.gov).

T2Q2 To what extent does the sampling design represent sensitive populations or ecosystems?

Clearly shows the status of the mature female (or spawning stock abundance) for blue crab in Chesapeake Bay.The blue crab represents a valuable commercial fishery across much of the eastern coast of the U.S. fishery. In Chesapeake Bay, harvest pressure on the species and the loss of the submerged aquatic vegetation habitat that young crabs require for shelter and food during their development, have led directly to the decline in the blue crab's numbers. Spawning stock abundance of female blue crabs is a key determinant of the status of this important fishery.

T2Q3 Are there established reference points, thresholds or ranges of values for this indicator that unambiguously reflect the state of the environment?

Yes - The long term average of all four surveys combined is used for comparing recent status and trends. Refer to the 2004 Chesapeake Bay Blue Crab Advisory Report Prepared by the Chesapeake Bay Stock Assessment Committee: June 2, 2004, at

http://noaa.chesapeakebay.net/fish/BCAR2004.pdf. Contact Derek Orner, NOAA Chesapeake Bay Office (derek.orner@noaa.gov).

T3Q1 What documentation clearly and completely describes the underlying sampling and analytical procedures used?

Refer to the 2004 Chesapeake Bay Blue Crab Advisory Report Prepared by the Chesapeake Bay Stock Assessment Committee: June 2, 2004, at http://noaa.chesapeakebay.net/fish/BCAR2004.pdf. Contact Derek Orner, NOAA Chesapeake Bay Office (derek.orner@noaa.gov).

T3Q2 Is the complete data set accessible, including metadata, data-dictionaries and embedded definitions or are there confidentiality issues that may limit accessibility to the complete data set?

Yes. Refer to the 2004 Chesapeake Bay Blue Crab Advisory Report Prepared by the Chesapeake Bay Stock Assessment Committee: June 2, 2004, at http://noaa.chesapeakebay.net/fish/BCAR2004.pdf. For data and information about the Winter Drege Survey go to http://www.dnr.state.md.us/fisheries/crab/winter_dredge.html For original Winter Dredge Survey data, go to http://noaa.chesapeakebay.net/fisheries/surveys.htm. For original VA Trawl Survey data go to http://www.fisheries.vims.edu/trawlseine/mainpage.htm. MD trawl and Calvert Cliffs survey data and information resides with the NOAA Chesapeake Bay Office. Contact Derek Orner, NOAA Chesapeake Bay Office (derek.orner@noaa.gov).

T3Q3 Are the descriptions of the study or survey design clear, complete and sufficient to enable the study or survey to be reproduced?

Yes. Refer to the 2004 Chesapeake Bay Blue Crab Advisory Report Prepared by the Chesapeake Bay Stock Assessment Committee: June 2, 2004, at http://noaa.chesapeakebay.net/fish/BCAR2004.pdf. Contact Derek Orner, NOAA Chesapeake Bay Office (derek.orner@noaa.gov).

T3Q4 To what extent are the procedures for quality assurance and quality control of the data documented and accessible?

The quality of the data for the Baywide winter dredge survey is by far the most comprehensive. Calvert Cliffs pot survey information has been collected in the same manner over all years of the survey but is limited to fishing season and fishing regulations. The two state trawl surveys have been collecting data and reporting results annually throughout the survey durations. For information about the Winter Drege Survey go to http://www.dnr.state.md.us/fisheries/crab/winter_dredge.html For VA Trawl Survey information go to http://www.fisheries.vims.edu/trawlseine/mainpage.htm. MD trawl and Calvert Cliffs survey inforamtion resides with the NOAA Chesapeake Bay Office. Contact Derek Orner, NOAA Chesapeake Bay Office (derek.orner@noaa.gov). For additional information refer to the 2004 Chesapeake Bay Blue Crab Advisory Report Prepared by the Chesapeake Bay Stock Assessment Committee: June 2, 2004, at http://noaa.chesapeakebay.net/fish/BCAR2004.pdf.

T4Q1 Have appropriate statistical methods been used to generalize or portray data beyond the time or spatial locations where measurements were made (e.g., statistical survey inference, no generalization is possible)?

Yes. Values are interpreted using a statistical average or standard score (Z-score) allowing for averaging of various data sets. Results are provided as an overall average as it moves above or below an average 0. (Positive numbers [above the 0 line] are better than average). Raw data are used to generate a standard score for each survey and averaged together to obtain an unweighted average Z-score estimate. For additional information refer to the 2004 Chesapeake Bay Blue Crab Advisory Report Prepared by the Chesapeake Bay Stock Assessment Committee: June 2, 2004, at http://noaa.chesapeakebay.net/fish/BCAR2004.pdf. Contact Derek Orner, NOAA Chesapeake Bay Office (derek.orner@noaa.gov).

T4Q2 Are uncertainty measurements or estimates available for the indicator and/or the underlying data set?

No. N/A

T4Q3 Do the uncertainty and variability impact the conclusions that can be inferred from the data and the utility of the indicator?

No. N/A

T4Q4 Are there limitations, or gaps in the data that may mislead a user about fundamental trends in the indicator over space or time period for which data are available?

No - the limitations in the survey will not mislead the user. MD trawl survey samples on in major tributaries of Maryland waters of Chesapeake Bay and the Calvert Cliffs survey was a spatially limited to the waters surrounding the power plant in Calvert County, MD. The VA trawl survey samples both tributaries and the mainstem Bay in VA and the winter dredge survey is Baywide, Contact Derek Orner, NOAA Chesapeake Bay Office (derek.orner@noaa.gov).